

Science, Decision-Support, and Capacity Building for Climate Resilience in Alaska

ACCAP ANNUAL REPORT
JUNE 1, 2016 – MAY 31, 2017

This performance period covers year 1 of Award NA16OAR4310162.

Photo courtesy of
Jack French

Alaska Center for Climate Assessment and Policy (ACCAP)

Climate change is already impacting seasons, landscapes and life in the North. These changes affect the health, lives, and livelihoods of Alaskans as well as the companies doing business in Alaska. ACCAP was established in 2006 and partners with stakeholders to create realistic community plans and climate adaptation strategies across Alaska. We study marine resources and assess climate change-related impacts on water availability, sea ice, wildfire and Alaska Native culture. Other work includes downscaling models as well as developing, testing, and evaluating research products and tools. ACCAP aims to establish partnerships among:

- Scientists and engineers
- State and local planners, policy-makers and governments
- Transportation, natural resource and land management agencies
- Industry
- Native non-profit organizations and Alaska Native tribes
- Non-governmental organizations
- Anyone whose decision-making is influenced by climate-related events

Photo courtesy of Brook Gamble, SNAP + ACCAP.

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ACCAP's Team

TEAM MEMBERS

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Coastal Community Resilience Specialist: Davin Holen

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Intern: Danielle Meeker

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ACCAP STEERING COMMITTEE

EX OFFICIO MEMBERS

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Molly McCammon, Director, *Alaska Ocean Observing System*

James Partain, Director, *NOAA Regional Climate Services, Alaska Region*

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Lawson Brigham, Professor of Geography & Arctic Policy, *UAF*

Ralph Townsend, Director, *Institute of Social and Economic Research, University of Alaska Anchorage*

Vera Metcalf, Director, *Alaska Eskimo Walrus Commission, Kawerak Inc.*

Cheryl Rosa, Deputy Director, *U.S. Arctic Research Commission*

Aimee Devaris, Director, *USGS, Alaska Region*

Kathy Jacobs, Director, *Center for Climate Adaptation Science and Solutions, University of Arizona*

ACCAP by the Numbers

20 projects

25 webinars (3 series)
with participation of 1000+

30 public and academic
presentations

100+ direct mentions
of ACCAP research and
researchers by media

\$637,000
in leveraged funds

Workshops & Training Participation

20+ in Alaska

16 at a national level

1 at a national level
workshop organized



Participants during the 2017 CPASW poster session. Photos by ACCAP.

Highlight

Climate Prediction and Applications Science Workshop (CPASW)

Jointly hosted by NOAA National Weather Service Climate Services Branch, ACCAP, and other partners and held May 2–4, 2017, the 15th annual Climate Prediction Applications Science Workshop (CPASW), was held in Anchorage, AK. It brought together over 130 climate researchers, information producers, and users to share developments in the research and applications of climate predictions for societal decision-making. Anchorage provided an unique venue for convening Alaska scientists and decision makers from around the nation.

The theme for the 2017 CPASW was *Understanding Extreme Events and Decision-Maker Needs in the Context of Climate Variability and Change*.

Key focus areas included:

- Climate information applications at local, regional, and global scales related to preparedness and management for weather and climate extremes

- Climate services for coastal and indigenous communities in high-latitude areas, including the Arctic
- Best practices of observing, documenting, and communicating climate information relevant for national, tribal and international collaborations
- Service delivery coordination and decision support for planning, resource allocation, sustainable development, and environmental management needed for building resilient communities
- Changes in climate and weather extremes

Short-term climate variability and long-term climate change as well as attribution science were crosscutting concerns for all of the focus areas, especially in preparedness activities for extreme events and supporting critical decision-making for several socio-economic sectors.

There were over 50 plenary presentations and four keynote presentations presented by such notable speakers such as Dr. Wayne Higgins, Director of the NOAA Climate Program Office and Dr. Rupa Kumar Kolli, World Meteorological Organization. Additionally over 40 posters were presented and field trips were offered to explore Anchorage and engage with the local NWS personal and the Alaska Weather, Water, and Ice Center located at the NWS Anchorage Forecast Office.



New Areas of Focus & Partnerships

Due to low snow/warm winter temperatures in Anchorage, the Alaska Railroad transports snow from Fairbanks for the start of the Iditarod Sled Dog Race.
Photo by the Alaska Dispatch News.

VIRTUAL ALASKA WEATHER SYMPOSIUM WEBINAR SERIES

In January of 2017 ACCAP established a partnership with the Geographic Information Network of Alaska (GINA) with the creation of the Virtual Alaska Weather Symposium (VAWS) webinar series. Established in 2001 as an initiative of the University of Alaska's President, GINA promotes collaboration at the local, state, and federal levels by increasing community-wide participation in the discovery and use of geospatial data. The VAWS webinar series is a resurrection of the previously in-person Alaska Weather Symposium that was a joint venture between GINA and the National Weather Service. VAWS provides a vehicle for ACCAP, GINA, and the NWS to bring cutting edge satellite based presentations to a broad statewide audience while avoiding the costs (both time and money) of an in-person symposium. The partnership leverages ACCAP's webinar infrastructure and listserv and GINA's and NWS's deep pool of potential speakers and topics. To date three successful webinars with topics relevant to wildfire management and river break-up have been held with other presentations identified for the remainder of 2017.

DRILLING DEEP: KNOWLEDGE CO-PRODUCTION IN CONTESTED SPACES

Investigator: Nathan Kettle

ACCAP evaluated the North Slope Borough-Shell Baseline Studies Program, an organization that was created based on a collaborative research agreement between the North Slope Borough of Alaska and Shell to improve information collection and management of issues associated with the potential impacts of oil and gas development on marine ecosystems and coastal communities dependent subsistence resources for their livelihoods. Factors contributing to the effective knowledge co-production within an emergent boundary organization in the context of a contentious political environment were investigated. The research was grounded in an understanding of the Baseline Studies Program as a boundary organization that exists at the frontier of science and decision-making.

The results showed that the Baseline Studies Program funded research was viewed as relevant to the needs of the villages and Shell Oil Company and research priorities were respectful of stakeholder values. The evaluation also revealed factors that helped produce

trusted science in a contested space, challenges to co-production, and advice for others seeking to establish partnerships between industry and indigenous communities.

DEVELOPING SEA ICE AND WEATHER FORECASTING TOOLS TO IMPROVE SITUATIONAL AWARENESS AND CRISIS RESPONSE IN THE ARCTIC

Investigator: Nathan Kettle

This project, funded by the Alaska Domain Awareness Center (a Department of Homeland Security Center of Excellence), aims to improve situational awareness and crisis response by enhancing support for planning and emergency response to emerging climate-related environmental marine hazards in the Arctic. We are developing a decision support tool for weather and sea ice-sensitive decision making. This includes interactions among UAF researchers, US Coast Guard emergency responders, NOAA forecasters, the NWS Alaska Sea Ice Program, Arctic Environmental Response Management Application (ERMA), and marine operators in the Arctic. Research is focused on the waters surrounding Barrow, Alaska, a sub region of the North Slope located on the north coast of Alaska between the Chukchi and Beaufort Seas. The project involves three phases: preliminary tool development, stakeholder feedback and tool optimization, and outreach, dissemination, and evaluation. The project will continue through 2019.



Investigators: Davin Holen, Tina Buxbaum

ACCAP is on the steering committee of the Alaska Ocean Acidification Network (AOAN), which was launched in 2016 and organized a State of the Science Workshop and built a website to coordinate a network of scientists and stakeholders (<http://www.aos.org/alaska-ocean-acidification-network/>). In November 2016 the AOAN held a two-day State of the Science Workshop composed of State and National researchers

and policy makers. This workshop was broadcast online via ACCAP's webinar platform. AOAN has been working collaboratively with the Ocean Acidification Specialist at Washington Sea Grant to educate both students and the general public on ocean acidification. An educator workshop was held as part of the State of the Science workshop and several schools were visited. ACCAP continues to be part of the small steering committee for the AOAN and will continue providing outreach and education support and leadership for the network.

TRIBAL CLIMATE SCIENCE LIAISON

With leveraged funds from the Bureau of Indian Affairs, ACCAP is partnering with the Aleutian Islands Pribilof Association and the Alaska Climate Science Center to support a tribal climate science liaison to improve the capacity of the 229 federally recognized tribes in Alaska for climate adaptation. The liaison is providing extension support, conducting research, and coordinating with other tribal climate science liaisons across the US. Extension support includes the identification of climate science needs, support of climate adaptation planning, and development of links between tribal needs and research capacity. ACCAP is also collaborating with the tribal liaison on climate adaptation research, including the analysis of barriers to climate adaptation and assessment of best practices for connecting climate science and tribal science needs to support climate-sensitive decisions and adaptation.

SYNTHESIS OF TRIBAL CLIMATE ADAPTATION IN ALASKA

Investigators: Nathan Kettle and Danielle Meeker

The project synthesized tribal climate adaptation needs assessments, workshop reports, and adaptation plans in Alaska to document barriers to climate adaptation planning, understand the current level of support for climate adaptation planning, examine the extent that climate science and traditional knowledge are being used in tribal climate adaptation plans, and identify climate science needs related to climate adaptation planning among Alaska Native tribes. This work was designed to inform the recently hired BIA tribal climate science liaison for Alaska.

Select Research Findings

STRATEGIES FOR FOSTERING SOCIOECONOMIC WELLBEING IN NORTHERN US AND RUSSIAN COMMUNITIES

Investigator: Katia Kontar

- Costs of the 2013 floods in Alaska have been estimated at over \$70,000,000

Alaska outcomes included:

- Decisions not to implement several measures attempted in Russia

Alaska and Russia outcomes included:

- A shift away from a policy of evacuation when flooding threatens
- A shift towards more proactive flood management

The project led to an agreement among various entities (local and tribal communities, State of Alaska, Fairbanks North Star Borough, and federal agencies such as the National Weather Service) to coordinate and invest in planning and mitigation efforts to minimize damage from future floods.

DRILLING DEEP: KNOWLEDGE CO-PRODUCTION IN CONTESTED SPACES

Investigator: Nathan Kettle

The following helped produce trusted science in a contested environment:

- A crisis situation and compelling circumstances
- Compelling leadership
- The use of experienced and trusted networks
- Top notch independent scientists

- The use of traditional knowledge, communicating early success stories
- Providing time to develop relationships and cross-cultural learning

Challenges:

- Potential conflicts of interest given the limited number of people familiar with the region
- Differences in cultures
- Tradeoffs in leveraging funds and maintaining community involvement
- Limited telecommunications infrastructure

Advice:

- Proving sufficient time for dialog and relationship building
- Ensuring strong leadership
- Thinking about how to sustain the program over the long-term

THE EXCEPTIONALLY WARM WINTER OF 2015-16 IN ALASKA: ATTRIBUTION AND ANTICIPATION

Investigators: John Walsh and Brian Brettschneider

- Alaska experienced record-setting warmth during the 2015-16 cold season (October-April)
- Statewide average temperatures exceeded the period-of-record mean by more than 4°C over the seven-month cold season and by more than 6°C over the four-month late-winter period, Jan-Apr
- The atmospheric circulation explains less than half of the anomalous warmth
- The warming signal forced by greenhouse gases in climate models accounts for about 1°C of the anomalous warmth
- Other contributing factors include anomalies in the surface state: (1) above-normal ocean surface temperatures and below-normal sea ice coverage in the surrounding seas from which air advects into Alaska and (2) the deficient snowpack over Alaska itself

- The increase of the “excess warmth” in late winter points to snow cover and its albedo effect, which is supported by observational measurements in the boreal forest and tundra biomes
- Climate model simulations indicate that warmth of this magnitude will become the norm by the 2040s and 2050s if greenhouse gas emissions follow their present scenario

AN ASSESSMENT OF THE ROLE OF ANTHROPOGENIC CLIMATE CHANGE IN THE ALASKA FIRE SEASON OF 2015

Investigators: John Walsh and Alison York

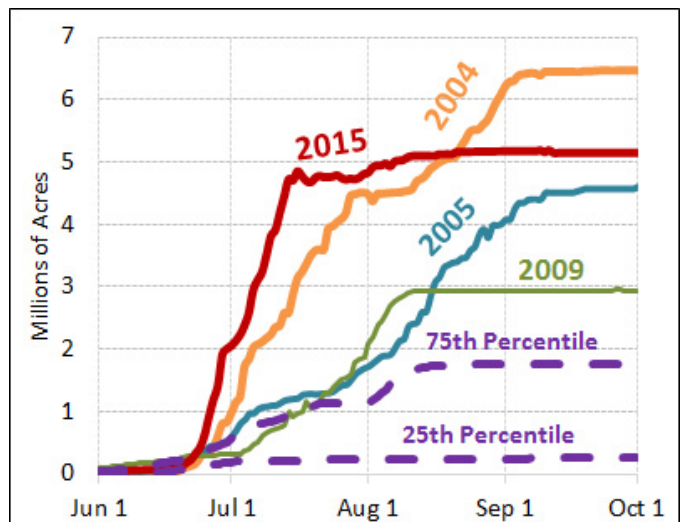
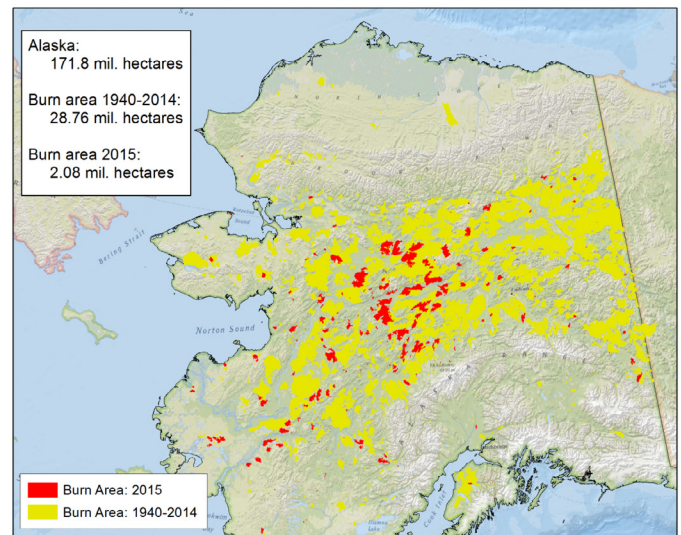
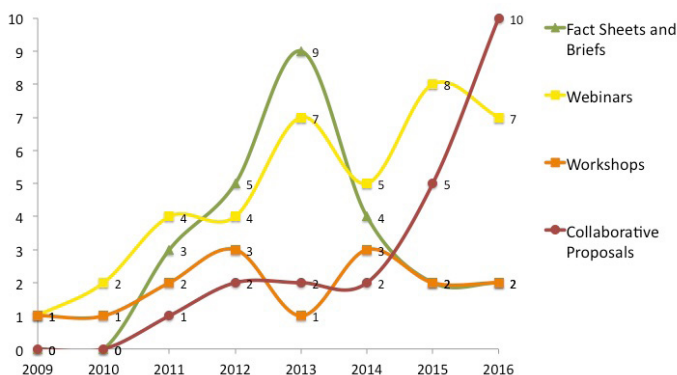
- The 2015 Alaska fire season burned the second largest number of acres since records began in 1940
- Human-induced climate change may have increased the risk of a fire season of this severity by 34%–60%.

ASSESSMENT OF THE APPLICATION OF CLIMATE INFORMATION IN WILDFIRE MANAGEMENT AND DECISION-MAKING IN ALASKA

Investigator: Melanie Colavito

- Climate change is one of the top three research needs identified by the interagency wildfire management community in Alaska and wildfire is projected to increase under climate change
- Alaska Fire Science Consortium (AFSC) utilizes a range of activities to deliver scientific information, promote two-way communication, and facilitate the development of new research
- AFSC’s partnership with ACCAP provides direct access to climate information and climate scientists, allowing AFSC to leverage resources to help in the Alaska wildfire management community
- AFSC’s activities have shifted over time from an emphasis on science delivery to an emphasis on knowledge co-production in order to facilitate the development of actionable scientific information that can be applied in wildfire management

AFSC Activities Over Time





“As changing climate and environmental conditions are impacting industries that operate in Alaska, now more than ever we need the type of accurate, reliable, and trust-worthy operationally-oriented research that ACCAP provides through support from the NOAA RISA Program.”

—David P. Ridge, Director Crowley Fuels LLC

Photo courtesy of
Norm Shippee, ACCAP

Highlighted ACCAP Research

ESTABLISHING A TARGETED, FUNCTIONAL STORMINESS INDICATOR FOR ALASKA AND NORTHWEST CANADA

Investigator: Norm Shippee

The Lull and Storm Winds (LSW) algorithm, developed using hindcast weather and climate information, has been modified to use forecast products from the current generation of global weather forecasting systems in the US, mainly the Global Forecasting System (GFS). Verification of the output from this modification is still being tested as of June 2017 and should conclude in July 2017. The results will help to inform stakeholders of wind hazards and lull periods at the operational (5 to 7 day) intervals. This effort is in addition to the current climatologies of these types of events that were generated in 2016.

The current stakeholders engaged in this project are shipping companies Crowley Maritime, Foss Maritime, Delta Western, Northern Transportation Corporation Limited (NTCL - Canada). There has been engagement of stakeholders at the planning level, with participation in workshops with NTCL and teleconferences with other stakeholders providing ways to integrate the new indicator information into planning. The storminess indicator is just now being used for general planning

activities, although we have not been informed to what extent it will be incorporated into this year's shipping season.

As a result of a presentation at the NOAA/ECCC Marine Forecasting Workshop in May 2016, additional work is being pursued with the NOAA/Environment Canada Marine Forecasting Project, including inputs from the indicator work into a new hazardous seas index being developed for Atlantic, Pacific, and Arctic waters. The invitation into this group presents an opportunity for international collaboration between major agencies of the US and Canada. This project is expected to continue into late 2017.

PROJECTING CHANGES TO EXTREME WEATHER AND CLIMATE FOR ALASKA DURING THE 21ST CENTURY

Investigator: Rick Lader

Extreme events are rare by definition, and because ecosystems are often not adapted to rare or unobserved conditions, rapidly changing extreme weather patterns can make these systems vulnerable. Using dynamically downscaled regional climate model simulations that cover a historical period (1976-2005) and future RCP8.5 scenario (2006-2100), this research has been

instrumental in several climate change attribution studies. One of these demonstrates that the 2015 Alaska wildfire season, which burned more than five million acres, was made 34-60% more likely due to anthropogenic effects (Partain et al. 2016). Another projects that the record warm winter of 2015/16 is likely to become normal by mid-century (Walsh et al. 2017).

This project documents an asymmetric warming of extremes. The observed ratio of record high maximum to record low minimum temperatures set now routinely exceeds 3:1. The future scenario projects an average increased growing season length of nearly 50 days, and a 50% increase in the maximum consecutive 5-day precipitation by 2100 (Lader et al. submitted). These findings have implications for land management decisions that are both short and long term in scope.

ACCAP contributed to the ongoing student research across the University of Alaska system via two Center for Global Change Student Grant Competition grants (cgc.uaf.edu/student_grant).

EVALUATING BEHAVIORAL ADAPTATIONS OF SUBSISTENCE HALIBUT HARVESTERS TO ENVIRONMENTAL AND REGULATORY CHANGES IN SOUTHEAST ALASKA

Investigator: Maggie Chan (UAF PhD student, School of Fisheries and Ocean Sciences)

This research improves upon existing data to better understand how subsistence harvesters adapt to a landscape of environmental and regulatory changes and links behavioral changes (i.e. metrics of fishing behavior) with the reason driving those behaviors.

Participants highlight the interconnectedness of subsistence harvesting from marine to terrestrial sources, including deer, shellfish, fish, and plant sources. It was common for participants to describe fish harvest amounts in comparison to the other resource harvest. However, management of resources is often by species, leading to a mismatch between the management decisions and the harvesting behavior. Therefore, participants talked about the importance of

regulatory flexibility. Findings highlight the importance of subsistence harvesting in rural communities in Alaska and that the success of management of such resources needs to recognize the unique features of subsistence harvesting, such as year to year flexibility in harvest amounts.

HOW WILL CLIMATE CHANGE IMPACT THE MORPHOLOGY OF THE BEAUFORT SEA COASTLINE?

Investigator: Louise Farquharson (UAF PhD Student, Geology)

The intent of this project was to use the Last Interglacial period as an analog for future conditions under climate change. As the Beaufort Sea rose, it crept inland, turning what is now tundra and thermokarst lakes, into tidal flats, lagoons, and eventually barrier islands and beaches.

Based on optically stimulated luminescence ages of sediment cores, instead of the marine transgression taking place 125,000 – 119,000 years ago when you expect sea levels to be the highest, these deposits were much younger: between 110,000 and 70,000 years old. Two main hypotheses were developed:

HYPOTHESIS 1: FOREBULGE COLLAPSE

The weight of the Laurentide Ice Sheet could have caused the Earth's crust to deform and depress below the ice sheet and bulge around the periphery, creating a forebulge (think muffin top). As the ice sheet melted the bulging around it would have subsided, causing sea level to rise locally around our site.

HYPOTHESIS 2: GROUNDED ICE SHEET

A big, heavy, grounded ice sheet, flowing east from Canada, could have depressed the Beaufort Sea coast below contemporary sea level, resulting in a marine transgression. At present the evidence leans most strongly in favor of the grounded ice sheet, but more fieldwork, potentially including offshore work is needed to confirm if this is correct.



CPASW 2017 participants listen intently. Photo courtesy of ACCAP.

Outreach & Communication Activities

WEBSITE: ACCAP.UAF.EDU

From June 1, 2016-May 31, 2017 the ACCAP site had 44,524 page views with 56.1% being new visitors and 43.9% being return visitors. The top pages were the home landing page, any and all pages having to do with CPASW, the NWS Alaska Climate Outlook Briefing Webinar page and the Alaska Climate Webinar series landing page. Visitors were primarily from Alaska but MD, WA, CA, and CO rounded out the top five states where website visits originated. Additionally we have website visitors from Canada, India, and Japan to name the top three after the US.

SOCIAL MEDIA

This year, ACCAP has seen a modest increase in social media influence, with 673 followers on Facebook (facebook.com/SNAPandACCAP/), up from 623 last year, and 398 followers on Twitter (@SNAPandACCAP), up from 316 last year.

ALASKA CLIMATE DISPATCH

Published since 2010 and written for a non-technical audience, the Alaska Climate Dispatch includes seasonal weather and climate summaries, feature articles on topics of current interest, and Alaska weather, wildfire, and sea ice outlooks. (accap.uaf.edu/dispatches).

WEBINARS

ALASKA CLIMATE WEBINAR SERIES

Our flagship webinar series has provided monthly opportunities to promote dialog among scientists, climate service providers, and decision makers since 2007. Over 700 people participated during this reporting period. This year featured university scientists (local and nation wide), Federal and State partners, and non-profits reporting on topics ranging from ocean acidification to stakeholder engagement efforts in support of the 4th National Climate Assessment. Recordings are available at: <http://accap.uaf.edu/webinars>.

NWS ALASKA CLIMATE OUTLOOK BRIEFING

In the third year of ACCAP's collaborative webinar series with the NWS, this monthly series delivers climate outlook briefings on recent climate conditions around Alaska and predictions for the next month and season. Briefings are well attended with 30-40 participants (online and in-person)/webinar. This collaboration is also helping to foster closer connections between NWS, the UAF research community and the broader climate and weather community including the National Park Service and US Army. In 2016, ACCAP conducted

The National Weather Service (NWS) Alaska Region and ACCAP.....have a long standing, mutually beneficial collaboration that enhances the effectiveness and compliments the essential mission of both organizations.

—CARVEN SCOTT, NWS ALASKA REGIONAL DIRECTOR

an evaluation of the NWS Alaska Climate Outlook Briefings to better understand our audience and facilitate improvements of the briefings. 31 people completed the survey and the response overall was very favorable.

VIRTUAL ALASKA WEATHER SYMPOSIUM WEBINAR SERIES

The Virtual Alaska Weather Symposium (VAWS) webinar series is a joint venture with the Geographic Information Network for Alaska (GINA), ACCAP, and the National Weather Service. This series brings cutting edge satellite based presentations to a broad audience while avoiding the costs (both time and money) of an in-person symposium. In this reporting period, three successful webinars (30-50 participants/webinar) have been held with other presentations identified for the remainder of 2017. The May webinar was presented in conjunction with the Week of the Arctic and featured a presentation on Finland's proposed meteorological cooperation under the Arctic Council.

DECISION SUPPORT TOOLS

CLIMATE AND WEATHER HIGHLIGHTS TOOL

Designed in collaboration with the NWS, the Climate and Weather Highlights Tool provides information about notable historical weather and climate events. Data reported are preliminary observations and are reported in daily, multi-day, monthly, and longer time scales. Users can select date ranges, filter results, click on individual events for further information, and zoom in/out of the map. Events are updated in near real-time. (https://accap.uaf.edu/?q=tools/climate_highlights).

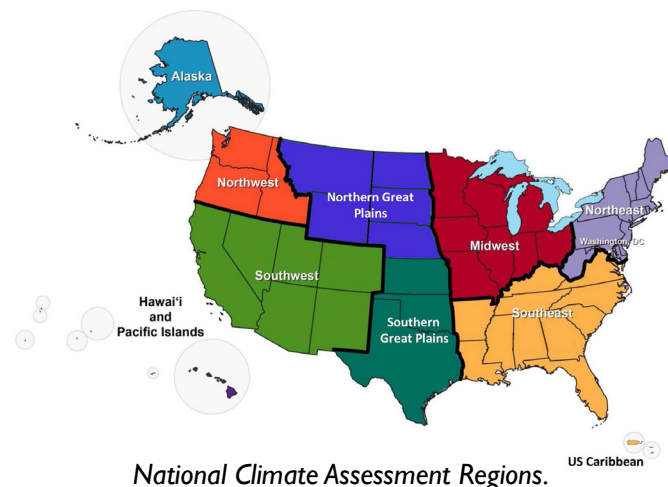
HISTORICAL SEA ICE ATLAS

In collaboration with the National Snow and Ice Data Center, we completed the compilation of a pan-Arctic sea ice dataset spanning 1850-present. The dataset is a gridded synthesis of information from approximately 15 different sources of sea ice information, ranging from whaling ship reports to more recent passive microwave satellite data. The monthly archive lists sources as well as areas of estimation by interpolation or analog methods. The dataset extends ACCAP's Historical Sea Ice Atlas for Alaska to an Arctic-wide scale. In addition to the work on the pan-Arctic database, ACCAP, with support from AOOS, has continued to update the Historical Sea Ice Atlas for Alaska. The most recent update extended to December 31, 2016 and is available at <http://seaiceatlas.snap.uaf.edu/>. The web interface for the pan-Arctic Atlas is under development.

REPORT CONTRIBUTIONS

Sarah Trainor is a contributing lead author and Nathan Kettle is a contributing author on the Alaska chapter of the 4th National Climate Assessment.

Additionally, both John Walsh and Sarah Trainor were key contributors to the Arctic Council Report, "Adaptation Actions for a Changing Arctic, Bering -Chukchi-Beaufort Region," published by the Arctic Monitoring and Assessment Programme (AMAP). John Walsh was one of three scientific editors, a lead author for the Introduction and Synthesis chapters and a contributing author for the Regional Drivers of Change chapter. Sarah Trainor was lead author for the Adaptation chapter and contributing author for the Synthesis chapter.





Key Publications

Photo courtesy of Jack French, SNAP + ACCAP.

Partain et al. 2016. **An assessment of the role of anthropogenic climate change in the Alaska fire season of 2015**. DOI:10.1175/BAMS-D-16-0149.1

The 2015 Alaska fire season burned the second largest number of acres since records began in 1940. Human-induced climate change may have increased the risk of a fire season of this severity by 34%–60%.

Walsh, J.E., P.A. Bieniek, B. Brettschneider, E.S. Euskirchen, R. Lader, and R.L. Thoman, 2017: **The Exceptionally Warm Winter of 2015/16 in Alaska**. *J. Climate*, 30, 2069–2088, DOI: 10.1175/JCLI-D-16-0473.1.

Alaska experienced record-setting warmth during the 2015/16 cold season (October–April). Statewide average temperatures exceeded the period-of-record mean by more than 4°C over the 7-month cold season and by more than 6°C over the 4-month late-winter period, January–April. Climate model simulations indicate that warmth of this magnitude will become the norm by the 2050s if greenhouse gas emissions follow their present scenario.

Colavito, M. 2017: **Utilising scientific information to support resilient forest and fire management**. *International Journal of Wildland Fire* 26(5) 375–383. DOI: <https://doi.org/10.1071/WF16158>.

Interviews were conducted with scientists, managers and other constituents to assess the use of scientific information in forest and fire management. The

results of interviews with scientists, managers and other constituents provide insight into the application, development and communication of scientific information, resilience research needs and recommendations for facilitating collaborative research.

Johnson, Terry, 2016: **Climate Change and Alaska Fisheries. Technical Report**. Alaska Sea Grant, University of Alaska Fairbanks. DOI: <https://doi.org/10.4027/ccaf.2016>

This book summarizes knowledge of North Pacific climate change and its anticipated effects on Alaska fisheries through the middle of the 21st century. During the working lifetime of today's younger fishermen, effects of long-term climate change on fisheries probably will be profound but not cataclysmic.

Kettle, N., S. Trainor, and P. Loring. **Conceptualizing the science-practice interface: lessons learned from a collaborative network on the front-line of climate change**. 2017 *Frontiers in Environmental Science* 5:33. DOI 10.3389/fenvs.2017.00033.

This paper highlights common co-design elements; discusses challenges experienced in co-design and then emphasizes a range of rarely articulated benefits of co-design for both researchers, societal partners and the work they aim to do together. It summarizes some of the knowledge gains on social transformation to sustainability from the co-design phase and concludes that co-design as a process is an agent of transformation itself.

Select Applications of ACCAP Work

STRATEGIES FOR FOSTERING SOCIOECONOMIC WELLBEING IN NORTHERN US AND RUSSIAN COMMUNITIES

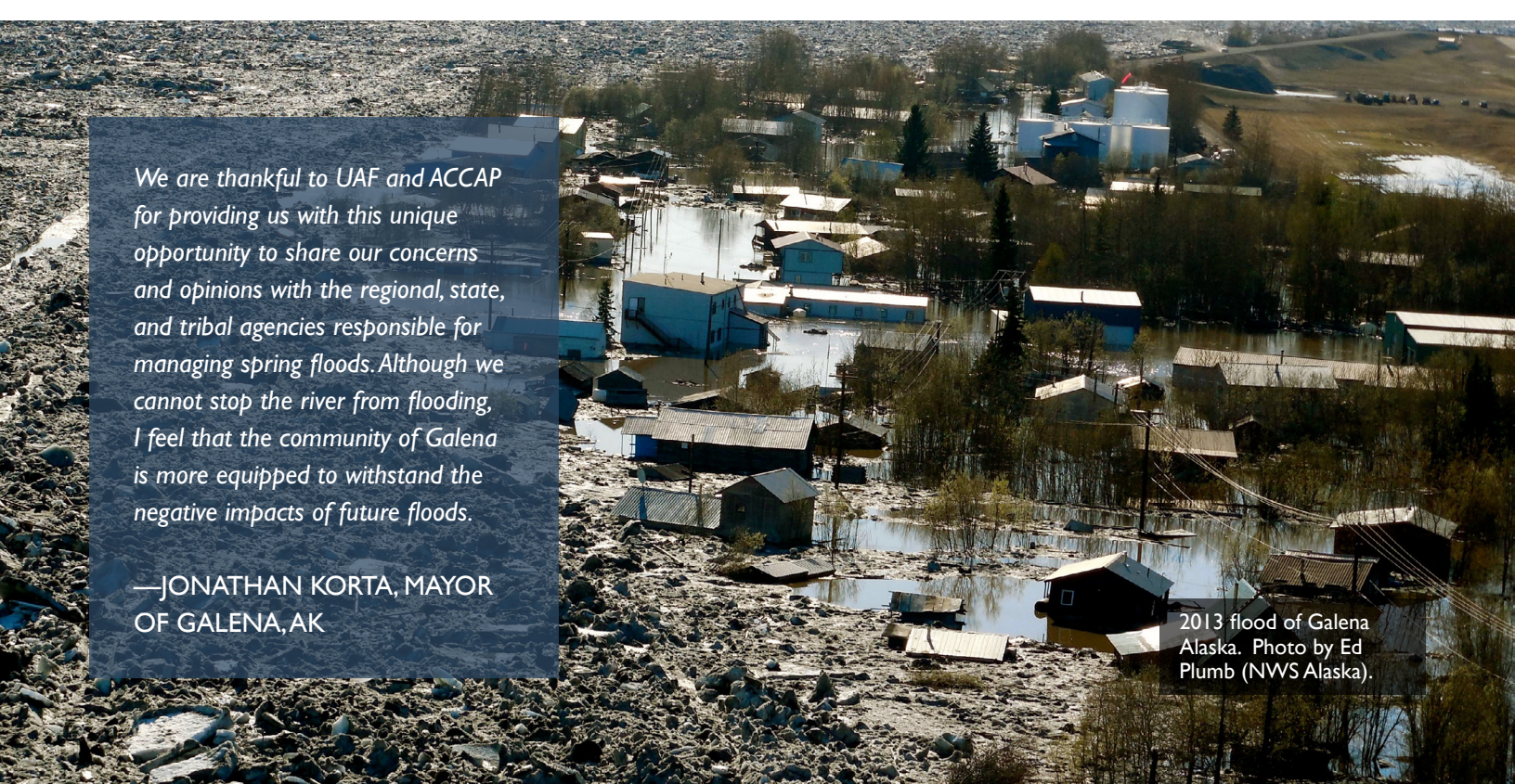
Investigator: Katia Kontar

In Alaska, US and Yakutia (Sakha Republic), Russia, rapid spring warming can force river ice to break up quickly and ice to pile in tremendous jams, flooding nearby settlements causing financial loss, injuries, loss of life, and displacement among other impacts. Significant funds are spent on annual disaster response and recovery efforts. Costs may be reduced, and community wellbeing improved, through a cross-society and cross-disciplinary approach to mitigating the problem.

In May 2013, massive ice jams caused severe flooding along the Yukon River in Interior Alaska and along the Lena River in central Yakutia. Floodwaters and ice debris

destroyed nearly the entire infrastructure of Galena, Alaska. Flooding of the village of Edeytsy in Namsky District, Yakutia, displaced nearly 1300 people and destroyed 250 private residences, as well as the majority of public infrastructure, including roads and bridges crucial to evacuation and emergency management.

In Alaska, the outcomes of this project in partnership with the US Department of State's P2P (Peer to Peer) program included decisions not to implement several measures attempted in Russia because their effectiveness has not been rigorously proven and costs could easily run into the hundreds of thousands of dollars. Other outcomes include a shift away from a policy of evacuation and a shift towards more proactive flood management in both communities. In Alaska, the project led to an agreement among various governmental entities to coordinate and invest in planning and mitigation efforts to minimize damage from future floods.



We are thankful to UAF and ACCAP for providing us with this unique opportunity to share our concerns and opinions with the regional, state, and tribal agencies responsible for managing spring floods. Although we cannot stop the river from flooding, I feel that the community of Galena is more equipped to withstand the negative impacts of future floods.

—JONATHAN KORTA, MAYOR OF GALENA, AK

2013 flood of Galena Alaska. Photo by Ed Plumb (NWS Alaska).



Photo courtesy of
SNAP/ACCAP.

Over the past several years, these two programs [ACCAP and the Alaska Fire Science Consortium] have worked closely with one another and with fire management agencies to meet managers' needs for science related to climate change and wildfire in Alaska. Their products are making a real difference for the Alaska Divisions of Forestry and the other agencies working on wildland fire issues in the state.

—JOHN “CHRIS” MAISCH C.F., STATE FORESTOR
AND DIRECTOR, AK DEPT OF NATURAL
RESOURCES, DIVISION OF FORESTRY

ASSESSMENT OF THE APPLICATION OF CLIMATE INFORMATION IN WILDFIRE MANAGEMENT AND DECISION- MAKING IN ALASKA

Investigator: Melanie Colavito

ACCAP conducted an assessment of the application of climate information in wildfire management and decision-making in Alaska through a case study of the Alaska Fire Science Consortium (AFSC).

We focused on the following research questions related to climate change and wildfire: 1. What activities does AFSC use to deliver science and facilitate the development of actionable science, especially climate and related science, to inform fire management in Alaska? 2. How does AFSC obtain and engage with climate information? 3. How have AFSC's activities and outputs evolved over time, especially with respect to facilitating the application of climate information in wildfire management?

We interviewed 30 participants and conducted participant observation of AFSC meetings, workshops, and other events. Archival and internal evaluation data were cataloged and reviewed and a chronology of AFSC activities was developed. Findings provide a comprehensive examination of AFSC, its relationship with ACCAP, and the collaborative role of these

organizations in facilitating the application of climate information in wildfire management in Alaska.

AFSC utilizes numerous activities, including research briefs, white papers, and publications, as well as oral science delivery outputs such as brown bag seminars, webinars, and conference presentations. They also utilize two-way communication strategies (workshops, meetings, and collaborative proposals) to facilitate interaction among their science and management participants. AFSC's activities have shifted over time from an emphasis on science delivery to an emphasis on knowledge co-production in order to facilitate the development of actionable scientific information that can be applied in wildfire management.

AFSC obtains climate information primarily through their interaction with Alaska climate scientists, many of whom have connections with ACCAP. AFSC and ACCAP are co-located which encourages in-person interactions and collaboration. They often coordinate on research, projects, webinars, and information products, such as the publication by Partain et al. 2016. AFSC's partnership with ACCAP provides direct access to climate information and climate scientists, thereby allowing AFSC to leverage resources to address the climate change research need in the Alaska wildfire management community. This relationship enhances the capacity of each organization to reach a broader audience.

ALASKA SEA GRANT STATEWIDE COASTAL COMMUNITY RESILIENCE

Investigator: Davin Holen

Jointly funded by ACCAP, Alaska Sea Grant, and the Alaska Ocean Observing System (AOOS), the Alaska Sea Grant Statewide Coastal Community Resilience Specialist is working to increase resilience in coastal Alaska Communities. Workshops in Western Alaska were held, to develop materials that describe climate impacts and adaptation strategies, and to build a coalition of Tribes, agencies, and communities to adapt to Alaska's changing climate.

The collective input was used to produce a coastal resilience toolbox that links coastal communities and managers to information and resources they need to adapting to climate change in Western Alaska and four posters that describe aspects of a changing climate. An effort to provide the toolbox and posters on an interactive website is in development.

Another workshop in Southeast Alaska was held for Tribes, researchers, agencies, and NGOs to develop monitoring, mitigation, and adaptation strategies. A synthesis of species that are most important for culture yet may be most impacted by a changing climate, and a Southeast Alaska regional climate adaptation plan were also developed.

Alaska Sea Grant is also partnering with the ACCAP to work collaboratively with the Central Council Tlingit Haida Indian Tribes of Alaska and Sitka Tribe of Alaska on a climate adaptation plan for Southeast Alaska funded by the Bureau of Indian Affairs.

In addition, the development of Adapt Alaska is underway. Adapt Alaska is a collaborative of communities, Tribes, agencies, and nonprofits to enable communities to adapt to rapidly changing ocean and climatic conditions and changing terrestrial landscape from Southeast Alaska to the Arctic.

- Adapt Alaska's website will provide access to and a means for compiling and sharing information on the nature and magnitude of climate change and related impacts.
- The site will lead users to practical climate change adaptation and resilience tools, resources and case studies, with a focus on first person Alaskan stories of successes and lessons learned.
- The site acts as a portal leading users to Alaska specific web resources outside the site relevant to their interests.
- Adapt Alaska is a tool to support and expand existing collaboration and networking. This supplements and strengthens the benefits of face-to-face meetings and helps to link people facing shared challenges.



Photo by Tony Weyiouanna Sr., Courtesy of SNAP/ ACCAP.



Photo courtesy of
Jack French, SNAP
+ ACCAP.

Student and Post-Doc Matriculation and Recruitment

Promoted

Nathan Kettle, former ACCAP post-doctoral fellow, was promoted to Research Assistant Professor and is a CO-I on ACCAP's new 5-year grant award. He is co-advising ACCAP student S. Tangen and intern D. Meeker.

Post Doctoral Fellows

Brian Brettschneider will be releasing a publicly-accessible visualization tool for analog forecasts of temperatures and wind patterns, in addition to sea ice. He will also be evaluating threshold exceedance frequencies relevant to extreme events over Alaska.

Melanie Covavito completed her evaluation of the process of science co-production and communication of climate information in wildlife management and decision-making in Alaska. She accepted a position as Human Dimensions Specialists at the Ecological Restoration Institute at Northern Arizona University.

Norman Shippee continues developing applied storminess indicators for Alaska through consultation with stakeholders in the marine shipping community and communities.

Josie Sam concluded her work on identifying adaptation efforts and best practices. This work is currently being prepared for publication.

Graduate Students

Katia Kontar (PhD Interdisciplinary Studies) successfully defended her dissertation on investigating how to improve preparedness and response to annual springtime flooding in Alaska and Russia. She has accepted a post-doctoral fellowship at the Fletcher School of Law and Diplomacy at Tufts University.

Rick Lader (PhD Atmospheric Sciences) continues assessing extreme climate events in dynamical downscaling output for Alaska.

Stefan Tangen (Master's Natural Resources Management) is conducting a case study looking at planning for climate change in Shaktoolik, AK. The study was done in partnership with the Tribal Council of the Native Village of Shaktoolik to understand how various actors involved in planning for climate change perceive success.

Overall Program Impact

Program-level impact

ACCAP continues to use a logic model to guide program assessment planning and program-level impact. This model, which provides the basis for program evaluation, describes the relationships among:

- The Alaska context
- Program inputs and resources
- Activities, impacts (what is produced)
- And impacts (changes that result from the program)

Based on our evaluation of the relationship with the Alaska Fire Science consortium (AFSC) we are beginning to investigate the programmatic impact of ACCAP. We have learned that AFSC's partnership with ACCAP provides direct access to climate information and climate scientists, thereby allowing AFSC to leverage resources to address the climate change research need in the Alaska wildfire management community.

Project Level Impact

On a project level basis, ACCAP undertook an evaluation of our NWS Alaska Climate Outlook Briefing webinar series using an online survey sent to Briefing participants.

Overall 31 of 230 invited participants answered the survey questions and feedback was overwhelmingly positive. 100% of respondents said they learned something from the webinar series and 80% of respondents used the information for their job responsibilities. Over 90% of

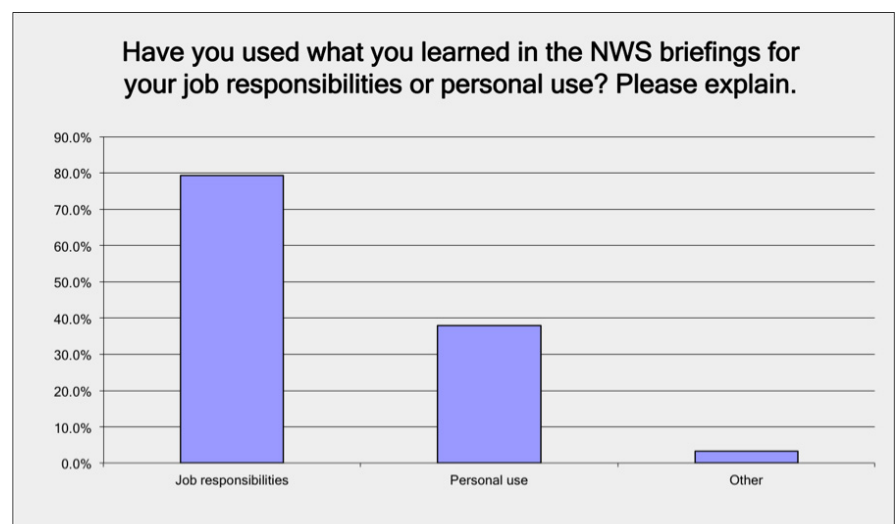
respondents said they have or would recommend the webinar series to others.

When asked what motivates participation in the Briefings respondents cited:

- “We are working with tribal villages in Norton Sound and want to understand their weather trends and projections”
- “As a military weather forecaster in Interior Alaska I find the analysis applicable”
- “I am new to the “NOAA family” and my job as Gulf Watch Alaska science coordinator requires that I stay current with oceanographic forecasts. Alaska is in my region and the briefing is useful for staying informed on weather and climate of the region ”
- “I am an avalanche forecaster, I use these briefing to plan my winters”

Feedback was generated on future topics and the depth and breadth of current topics was considered by respondents to be appropriate and well communicated. Overall the value of the NWS Climate Outlook Briefings was confirmed through the survey responses.

Use of Climate Outlook Briefing information by respondents (n=31).



Additional Publications

PEER-REVIEWED PUBLICATIONS

ARTICLES

Cherry, J. E., Knapp, C. N., Trainor, S., Ray, A. J., Tedesche, M. and Walker, S. 2017. Planning for climate change impacts on hydropower in the Far North. *Hydrology and Earth System Sciences*, 21: 133-151. doi:10.5194/hess-21-133-2017.

Kontar, Y.Y., Trainor S.F., Gavrylieva, T.N., Echelberger, J.C., and Tananaev N.I. (In Press). Advancing Springtime Flood Risk Reduction in the Arctic through International and Interagency Collaborations. *Global Change and Future Earth: The Geodetic and Geophysical Perspective*. Cambridge University Press.

Overland, J.E., E. Hanna. I. Hanssen-Bauer, S.-J. Kim, **J. Walsh**, M. Wang, U.S. Bhatt and R.L. Thoman, 2016: Air temperature. In *The Arctic* (J. Richter-Menge and J. Mathis, Eds.), State of the Climate in 2015, Bulletin of the American Meteorological Society, 97(8), S132-S134.

Penn, H.J., S.C. Gerlach, and **P.A. Loring**, 2016: Seasons of Stress: Understanding the Dynamic Nature of People's Ability to Respond to Change and Surprise. *Wea. Climate Soc.*, 8, 435–446.

Penn, H.J., Philip A. Loring, William E. Schnabel, Diagnosing water security in the rural North with an environmental security framework, *Journal of Environmental Management*, Volume 199, 1 September 2017, Pages 91-98.

Walsh, J.E., R.L. Thoman, U.S. Bhatt, P.A. Bieniek, **B. Brettschneider**, M. Brubaker, S. Danielson, **R. Lader**, F. Fetterer, K. Holderied, K. Iken, A. Mahoney, M. McCammon and J. Partain, 2017: The high-latitude marine heat wave of 2016 and its impacts on Alaska. *Bulletin of the American Meteorological Society*, accepted.

REPORTS

Kienholz, C., R. Hock, M. Truffer, P. Bieniek, and **R. Lader**, 2017: Mass balance evolution of Black Rapids Glacier, Alaska, 1980-2100, and its implications for surge recurrence. *Front. Earth Sci.*, 5:56.

Mard, J., J.E. Box, R. Brown, W.T. Colgan, M. Mack, S.H. Mernild, D. Walker and **J.E. Walsh**, 2017: Cross-Cutting Scientific Issues. Chapter 9 in *Snow, Water, Ice and Permafrost in the Arctic* (2017), Arctic Monitoring and Assessment Programme, Oslo, in press.

Overland, J.E., **J.E. Walsh** and V. Kattsov, 2017: Trends and Feedbacks. Chapter 2 in *Snow, Water, Ice and Permafrost in the Arctic* (2017), Arctic Monitoring and Assessment Programme, Oslo, in press.

Adaptation Actions for a changing Arctic (AACA) - Bering -Chukchi - Beaufort REGION. Arctic monitoring and Assessment Programme (AMAP). Oslo, Norway. J.E. Walsh Chapter 9 Synthesis, Editor. S.F. Trainor, Chapter 7 Adaptation, Chapter 9, Synthesis.

NON-PEER REVIEWED PUBLICATIONS

Holen, Davin, Drew Gerkey, Even Høydahl, David Natcher, Martin Reinhardt Nielsen, Birger Poppel, Paul Inge Severeide, Hunter T. Snyder, Mary Stapleton, Ellen Inga Turi, and Iulie Aslaksen. 2017 Interdependency of subsistence and market economies in the Arctic In *The Economy of the North 2015 (ECONOR III)*. Solveig Glomsrod, Gérard Duhaime, and Iulie Aslaksen, eds. Oslo. Statistics Norway.

Meeker, D. 2017. A synthesis of climate adaptation planning needs in Alaska Native Communities. Alaska Center for Climate Assessment and Policy; Fairbanks, AK. 44 pages.

Swanson, Michaela M. and Sarah F. Trainor. Current Coastal Change Projects and Priority Information Needs from Cook Inlet through Southeastern Alaska. Final Project Report. Fairbanks, AK.

Walsh, J.E., T. Buxbaum, E. Funk, and A. York (eds). Alaska Climate Dispatch Quarterly Newsletter. (<https://accap.uaf.edu/library/dispatches>)

Trainor, S. F., Walsh, J. E., Gamble, J. B. (2017). Human Adaptation to Climate Change in Alaska: Overview and Recommendations for Future Research and Assessment. Technical Report #16-1. International Arctic Research Center, University of Alaska Fairbanks.

Attachments/ Appendices

All attachments have been optimized and placed in one PDF for digital delivery. Please request higher resolution files for print.

1. Alaska Climate Dispatch
2. Five key peer-reviewed journal publication listed previously.



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